

CLAIMS

1. A target practice laser transmitting/receiving system including a laser transmitter for transmitting a laser signal and a laser receiver for receiving a laser signal, wherein

said laser transmitter is provided with a modulator for modulating a laser signal by position information of said laser transmitter and

said laser receiver is provided with an information extractor for extracting said position information from said laser signal and a judgment unit for judging the shot effect of a shot from said laser transmitter using the extracted position information.

2. A target practice laser transmitting/receiving system as set forth in claim 1, wherein said laser transmitter is a shooting side apparatus receiving a shot trigger signal from a shooting apparatus of a weapon and transmitting said laser signal in the shot direction; and said shooting side apparatus is provided with a shooting side position finder for generating said position information and a shooting side recording apparatus for continuously recording the position information output from said shooting side position finder and is designed to transmit not only an ID number of said shooting side apparatus, shot weapon type information, and shot munition type information, but also the position information of said shooting side apparatus output from said shooting side position finder included in said laser signal in response to receipt of a shot trigger signal from the shooting apparatus of the weapon.

3. A target practice laser transmitting/receiving system as set forth in claim 2, wherein said shooting side position finder also generates time information of the time said shooting side position finder generated said position information, said shooting side recording apparatus also continuously records the time information output from said shooting side position finder, and said

transmitter transmits not only the position information of said shooting side apparatus, but also said time information output from said shooting side position finder included in said laser signal in response to receipt of a shot trigger signal from the shooting apparatus of the weapon.

4. A target practice laser transmitting/receiving system as set forth in claim 1, wherein said laser receiver is a target side apparatus for receiving a laser signal from said laser transmitter and judging the shot effect; said target side apparatus is provided with a target side position finder for generating position information of said target side apparatus, a target side recording apparatus for continuously recording position information output from said target side position finder, and a munition type parameter recorder for recording munition type parameters necessary for calculation of a hit risk range for each shot munition type and uses the position information of said target side apparatus obtained from said target side position finder when receiving a laser signal transmitted by said shooting side apparatus, shot weapon type information included in the laser signal transmitted by said shooting side apparatus obtained from said parameter recorder, and munition type parameters including the velocity of the shot munition recorded for each shot munition type information, the plurality of ranges of tracking of a target by a shot munition set for the different states of damage, and the effective time or effective range of the shot munition to calculate and record the hit risk range by a coordinate range of a 3D reference system and compares the recorded hit risk range and position of said target side apparatus obtained from said target side position finder so as to judge the shot effect.

5. A target practice laser transmitting/receiving system as set forth in claim 4, wherein said target side position finder also generates time information of the

time of generation of the position information, said target side recording apparatus also records said time information output from said target side position finder, said hit risk range is calculated and recorded for each
5 predetermined elapsed time from a shot, and said shot effect is judged for every predetermined elapsed time from a shot.

6. A target practice laser transmitting/receiving system as set forth in claim 4 or 5, wherein said system
10 is further provided with a munition type parameter write apparatus for preparing munition type parameters required for calculation of said hit risk range and writing them in said target side apparatus, and said munition type parameter write apparatus is provided with a means for
15 preparing and recording said munition type parameters for each said shot weapon type information and said shot munition type information and writing them in said munition type parameter recorder of said target side apparatus.

20 7. A target practice laser transmitting/receiving system as set forth in claim 5, wherein said shooting side apparatus is further provided with a terrain recorder for recording coordinate ranges of the 3D reference system of terrain-based safe regions,
25 calculates and records a shot heading based on position information of said target side apparatus obtained from said target side position finder for each elapse of a predetermined time from receiving a laser signal transmitted from said shooting side apparatus and
30 position information of said shooting side apparatus obtained from the laser signal transmitted by said shooting side apparatus, and compares the coordinate ranges of the 3D reference system of the terrain-based safe regions recorded by said terrain recorder for each
35 heading at which said target side apparatus is shot and the position of said target side apparatus obtained from said target side position finder so as to judge the shot

effect.

8. A target practice laser transmitting/receiving system as set forth in claim 5, wherein said system is further provided with a terrain write apparatus for
5 calculating and recording terrain-based safe regions for each heading at which said target side apparatus is shot and writing them in said target side apparatus, and said terrain write apparatus is provided with a means for
10 calculating and recording terrain-based safe regions caused by specific terrain able to be used for evasive action of shooting in an actual practice grounds, that is, projecting terrain and recessed terrain, for each heading at which said target side apparatus is shot as
15 ranges giving a dead angle from said shooting side apparatus and arranging them on a map of the practice grounds matched with the terrain of the practice grounds so as to calculate and record the terrain-based safe regions by coordinate ranges of the 3D reference system and a means for writing the calculated terrain-based safe
20 regions in said terrain recorder of said shooting side apparatus.

9. A target practice laser transmitting/receiving system as set forth in claim 1, wherein said shooting side apparatus is further provided with a shot simulator
25 including a plurality of smoke generators of different smoke colors for simulating a shot when receiving a shot trigger signal of a weapon and changes the color of the smoke to simulate the shot by selection of one of said plurality of smoke generators in accordance with the shot
30 munition type.

10. A target practice laser transmitting/receiving system as set forth in claim 4, wherein said target side apparatus is further provided with a smoke generator and changes the amount of smoke from said smoke generator in
35 accordance with the results of judgment of the shot effect to simulate the damage.

11. A target practice laser transmitting/receiving

system as set forth in claim 4, wherein said target side apparatus is provided with an evasive action recorder for recording evasive action of said target side apparatus when receiving a laser signal transmitted by said shooting side apparatus and records in said evasive action recorder the position of said target side apparatus for every elapse of a predetermined time from receiving the laser signal transmitted by said shooting side apparatus, position of said shooting side apparatus, position of said shot munition, plurality of ranges of tracking of a target by a shot munition set for the different states of damage, heading at which said target side apparatus was shot, and results of judgment of the shot effect.

12. A target practice laser transmitting/receiving system as set forth in claim 11, wherein said system is further provided with an evasive action evaluation apparatus for reading and displaying the path of movement of said target side apparatus recorded when said target side apparatus is shot at, and said evasive action evaluation apparatus is provided with a means for reading the position of said target side apparatus recorded in the evasive action recorder of said target side apparatus, position of said shooting side apparatus, position of said shot munition, plurality of ranges of tracking of a target by a shot munition set for the different states of damage, heading at which said target side apparatus is shot, and results of judgment of the shot effect and a means for displaying and recording the position of said shooting side apparatus, heading at which said target side apparatus is shot, hit risk range, path of said target side apparatus, and results of judgment of the shot effect for a predetermined elapsed time after shooting by the read data.

13. A target practice laser transmitting/receiving system as set forth in claim 1, wherein said laser receiver is a target side apparatus receiving a laser

signal from said laser transmitter to judge the shot effect; and said target side apparatus is provided with a target side position finder for generating position information of said target side apparatus and a target side recording apparatus for continuously recording said position information output from said target side position finder and is designed to calculate the difference in distance between said shooting side apparatus and said target side apparatus at the time of a shot from the position information of said target side apparatus obtained by said target side position finder and position information of said shooting side apparatus obtained from the laser signal transmitted by said shooting side apparatus and judge the extent of damage in accordance with the difference in distance when receiving a laser signal transmitted by said shooting side apparatus and when the modulated shot weapon type information included in the laser signal transmitted by said shooting side apparatus simulates a small weapon including a rifle or pistol.

14. A target practice laser transmitting/receiving system as set forth in claim 13, wherein said target side position finder also generates time information of the time when said target side position finder generated said position information, and said target side recording apparatus also continuously records the time information output from said target side position finder.

15. A target practice laser transmitting/receiving system as set forth in claim 3, wherein said laser receiver is a target side apparatus receiving a laser signal from said laser transmitter to judge the shot effect; and said target side apparatus is provided with a target side position finder for generating position information of said target side apparatus, a target side recording apparatus for continuously recording said position information output from said target side position finder, a means for detecting, updating, and

recording the heading which said target side apparatus faces, and a means for calculating the heading shot at from the shooting side position information obtained from the laser signal transmitted by said shooting side apparatus and combining this with the heading which said target side apparatus faces to judge the damaged part when receiving the laser signal transmitted by said shooting side apparatus and judging the shot effect.

16. A target practice laser transmitting/receiving system as set forth in claim 4, wherein said system is provided with damage simulators comprised of smoke generators, vibrators, and speakers for simulation at a plurality of parts of said target side apparatus and is designed to simulate damage by a simulator in the vicinity of a damaged part in accordance with the judgment of a damaged part.

17. A target practice laser transmitting/receiving system as set forth in claim 3, wherein said laser receiver is a target side apparatus receiving a laser signal from said laser transmitter to judge the shot effect; and said target side apparatus is provided with a target side position finder for generating position information of said target side apparatus, a target side recording apparatus for continuously recording said position information output from said target side position finder, and a self recognizing means for comparing the position information of said target side apparatus and the position information of the shooting side obtained from the laser signal transmitted by said shooting side apparatus when receiving the laser signal transmitted by said shooting side apparatus and, when the position information are the same, deeming that a laser signal transmitted by said target side apparatus has been received by said target side apparatus and not judging the shot effect.

18. A target practice laser transmitting/receiving system as set forth in claim 17, wherein said target side

position finder also generates time information of the time when said target side position finder generated said position information, and said target side recording apparatus also continuously records the time information output from said shooting side position finder.

19. A target practice laser transmitter for transmitting a laser signal,

said laser transmitter characterized in that said laser transmitter is provided with a modulator for modulating a laser signal by position information of said laser transmitter.

20. A target practice laser transmitter as set forth in claim 19, wherein said laser transmitter is a shooting side apparatus receiving a shot trigger signal from a shooting apparatus of a weapon and transmitting said laser signal in the shot direction; and said shooting side apparatus is provided with a shooting side position finder for generating said position information and a shooting side recording apparatus for continuously recording the position information output from said shooting side position finder and is designed to transmit not only an ID number of said shooting side apparatus, shot weapon type information, and shot munition type information, but also the position information of said shooting side apparatus output from said shooting side position finder included in said laser signal in response to receipt of a shot trigger signal from the shooting apparatus of the weapon.

21. A target practice laser transmitter as set forth in claim 20, wherein said shooting side position finder also generates time information of the time said shooting side position finder generated said position information, said shooting side recording apparatus also continuously records the time information output from said shooting side position finder, and said transmitter transmits not only the position information of said shooting side apparatus, but also said time information

output from said shooting side position finder included in said laser signal in response to receipt of a shot trigger signal from the shooting apparatus of the weapon.

22. A target practice laser transmitter as set forth in claim 21, wherein said shooting side apparatus is further provided with a terrain recorder for recording coordinate ranges of a 3D reference system of terrain-based safe regions, calculates and records a shot heading based on position information of said target side apparatus obtained from said target side position finder for each elapse of a predetermined time from receiving a laser signal transmitted from said shooting side apparatus and position information of said shooting side apparatus obtained from the laser signal transmitted by said shooting side apparatus, and compares the coordinate ranges of the 3D reference system of the terrain-based safe regions recorded by said terrain recorder for each heading at which said target side apparatus is shot and the position of said target side apparatus obtained from said target side position finder so as to judge the shot effect.

23. A target practice laser transmitter as set forth in claim 21, wherein said shooting side apparatus is further provided with a shot simulator including a plurality of smoke generators of different smoke colors for simulating a shot when receiving a shot trigger signal of a weapon and changes the color of the smoke to simulate the shot by selection of one of said plurality of smoke generators in accordance with the shot munition type.

24. A target practice laser receiver for receiving a laser signal,

said laser receiver characterized in that said laser receiver is provided with an information extractor for extracting said position information from said laser signal and a judgment unit for judging the shot effect of a shot from a laser transmitter using the

extracted position information.

25. A target practice laser receiver as set forth in claim 24, wherein said laser receiver is a target side apparatus for receiving a laser signal from said laser transmitter and judging the shot effect; said target side apparatus is provided with a target side position finder for generating position information of said target side apparatus, a target side recording apparatus for continuously recording position information output from said target side position finder, and a munition type parameter recorder for recording munition type parameters necessary for calculation of a hit risk range for each shot munition type and uses the position information of said target side apparatus obtained from said target side position finder when receiving said laser signal, shot weapon type information included in said laser signal obtained from said parameter recorder, and munition type parameters including the velocity of the shot munition recorded for each shot munition type information, the plurality of ranges of tracking of a target by a shot munition set for the different states of damage, and the effective time or effective range of the shot munition to calculate and record the hit risk range by a coordinate range of a 3D reference system and compares the recorded hit risk range and position of said target side apparatus obtained from said target side position finder so as to judge the shot effect.

26. A target practice laser receiver as set forth in claim 25, wherein said target side position finder also generates time information of the time of generation of the position information, said target side recording apparatus also records said time information output from said target side position finder, said hit risk range is calculated and recorded for each predetermined elapsed time from a shot, and said shot effect is judged for every predetermined elapsed time from a shot.

27. A target practice laser receiver as set forth

in claim 25, wherein said target side apparatus is further provided with a damage simulator including a plurality of smoke generators of different amounts of smoke for simulating damage when the results of judgment of the shot effect are output and one of said smoke generators is selected in accordance with the results of judgment of the shot effect so as to change the amount of smoke to simulate the damage.

28. A target practice laser receiver as set forth in claim 25, wherein said target side apparatus is provided with an evasive action recorder for recording evasive action of said target side apparatus when receiving a laser signal transmitted by said shooting side apparatus and records in said evasive action recorder the position of said target side apparatus for every elapse of a predetermined time from receiving the laser signal transmitted by said shooting side apparatus, position of said shooting side apparatus, position of said shot munition, plurality of ranges of tracking of a target by a shot munition set for the different states of damage, heading at which said target side apparatus was shot, and results of judgment of the shot effect.

29. A target practice laser receiver as set forth in claim 24, wherein said laser receiver is a target side apparatus receiving a laser signal from said laser transmitter to judge the shot effect; and said target side apparatus is provided with a target side position finder for generating position information of said target side apparatus and a target side recording apparatus for continuously recording said position information output from said target side position finder and is designed to calculate the difference in distance between said shooting side apparatus and said target side apparatus at the time of a shot from the position information of said target side apparatus obtained by said target side position finder and position information of said shooting side apparatus obtained from the laser signal transmitted

by said shooting side apparatus and judge the extent of damage in accordance with the difference in distance when receiving a laser signal transmitted by said shooting side apparatus and when the modulated shot weapon type information included in the laser signal transmitted by
5 said shooting side apparatus simulates a small weapon including a rifle or pistol.

30. A target practice laser receiver as set forth in claim 29, wherein said target side position finder
10 also generates time information of the time when said target side position finder generated said position information, and said target side recording apparatus also continuously records the time information output from said target side position finder.

31. A target practice laser receiver as set forth in claim 24, wherein said laser receiver is a target side apparatus receiving a laser signal from said laser
15 transmitter to judge the shot effect; and said target side apparatus is provided with a target side position finder for generating position information of said target
20 side apparatus, a target side recording apparatus for continuously recording said position information output from said target side position finder, a means for detecting, updating, and recording the heading which said
25 target side apparatus faces, and a means for calculating the heading shot at from the shooting side position information obtained from the laser signal transmitted by said shooting side apparatus and combining this with the heading which said target side apparatus faces to judge
30 the damaged part when receiving the laser signal transmitted by said shooting side apparatus and judging the shot effect.

32. A target practice laser receiver as set forth in claim 25, wherein said receiver is provided with
35 damage simulators comprised of smoke generators, vibrators, and speakers for simulation at a plurality of parts of said target side apparatus and is designed to

simulate damage by a simulator in the vicinity of a damaged part in accordance with the judgment of a damaged part.

5 33. A target practice laser receiver as set forth
in claim 24, wherein said laser receiver is a target side
apparatus receiving a laser signal from said laser
transmitter to judge the shot effect; and said target
side apparatus is provided with a target side position
finder for generating position information of said target
10 side apparatus, a target side recording apparatus for
continuously recording said position information output
from said target side position finder, and a self
recognizing means for comparing the position information
of said target side apparatus and the position
15 information of the shooting side obtained from the laser
signal transmitted by said shooting side apparatus when
receiving the laser signal transmitted by said shooting
side apparatus and, when the position information are the
same, deeming that a laser signal transmitted by said
20 target side apparatus has been received by said target
side apparatus and not judging the shot effect.

25 34. A target practice laser receiver as set forth
in claim 33, wherein said target side position finder
also generates time information of the time when said
target side position finder generated said position
information, and said target side recording apparatus
also continuously records the time information output
from said shooting side position finder.